

In the May 2007 edition of this column, we compared recessed LED downlights with their CFL and incandescent counterparts and noted “LED downlight products announced for market introduction this year are expected to exceed CFL performance (more on this in future columns).” Just six months later, new products on the market reflect the rapid pace of LED technology advances. While there is still a broad range of performance seen in LED downlights, from poor to excellent, the improvements at the high end of the scale are worth noting.

The data for this update comes from Rounds 2 and 3 of the U.S. Department of Energy’s CALiPER program (Commercially Available LED Product Evaluation and Reporting program, formerly the SSL Commercial Product Testing Program), which provides ongoing evaluation of LED products purchased on the open market. CALiPER helps DOE track the progress of LED products on the market and share reliable, objective product performance information.

RECENT RESULTS

Figure 1 shows lumen output and efficacy for LED, CFL and incandescent downlights. LED downlight test results are highlighted in green, separating 2006 and 2007 results to show the rapid progress in both parameters. The large gray ellipse indicates the performance range we see in CFL downlights designed to provide simi-

lar output to a 60-W incandescent. The narrow gray ellipse summarizes the performance of incandescent downlights using 45-W and 65-W lamps. The values shown for the LED downlights are from CALiPER testing. The values for the CFL and incandescent downlights are assembled from CALiPER testing, 2002 photometric testing and product catalogs.

Among the products evaluated and tested, several points should be noted:

- For efficacy, the best-performing LED downlights now match or exceed CFL downlights.
- The best-performing LED downlights match or exceed most CFLs and incandescents in light output (lumens).
- Efficacy improved by a factor of three when comparing the best LED downlights tested from 2006 and 2007.
- Among LED devices, the four 2007 LED products have lumen outputs that are approximately double that of the 2006 LEDs.
- The least efficacious LED downlight tested is still better than the most efficacious incandescent downlight.

These latest results offer a snapshot of continuing improvement in LED downlight performance that shows no signs of abating. At this rate,

we expect the ellipse for 2008 LED devices to move even further to the right, although the spread in LED product performance is expected to remain large. Even now there are LED downlight products on the market that clearly offer comparable or superior performance versus traditional technologies.

The inherent advantages of LED downlights—directionality, dimmability and long life—combined with superior performance make a compelling case for consideration. So are LED downlights ready for purchase and use? Some are, and some are not.

While comparisons are useful for evaluating industry trends, product purchasing decisions must be done on a case-by-case basis, taking the specific product and application into consideration. Table 1 provides more detailed CALiPER downlight testing data for comparison and highlights the wide divergence in performance results across the tested products. For example, the light

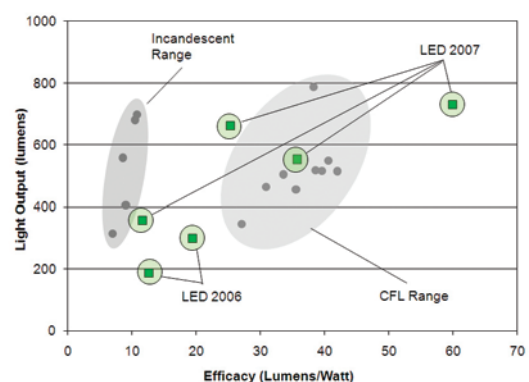


Figure 1: Comparison of Downlight Sources and Performance

	Total Watts	Output Lumens	Luminaire Efficacy	CCT	CRI
LED Downlight Retrofit Lamp	12	730	60	2758	95
LED Downlight Fixtures	15	553	36	3442	81
	26	662	25	4402	76
	15	298	19	2724	67
	15	187	13	2969	70
	31	357	12	5964	76
CFL Downlight Fixtures	12	514	42	2729	82
	13	346	27	3928	79

Source: Test results for LED downlight retrofit lamp, LED downlight fixtures, and CFL downlight fixtures tested as of 9/14/07, U.S. Department of Energy CALiPER program, http://www.netl.doe.gov/ssl/comm_testing.htm

Table 1: CALiPER Downlight Test Results to Date

output of the LED downlights tested varies considerably from product to product, with three products demonstrating high output. Buyers should ask manufacturers for photometric test data for the luminaire and request a sample fixture to evaluate.

Likewise, buyers should ask for information on the correlated color

temperature and color quality for a given application.

DOE's CALiPER program will continue to evaluate newly available commercial LED products to provide insights on performance improvements, variability in performance parameters across products and benchmarking data from traditional sources for comparison

temperature and color rendering of the LEDs used, and evaluate the luminaire in person. Visual assessment may provide additional insight about the suitability of the color quality for a

of lighting devices. To date, 60 products have been tested. For more information, visit http://www.netl.doe.gov/ssl/comm_testing.



James Brodrick is the lighting program manager for the U.S. Department of Energy, Building Technologies Program. The Department's national strategy to guide high-efficiency, high-performance solid-state lighting products from laboratory to market draws on key partnerships with the lighting industry, research community, standards organizations, energy efficiency programs, utilities and many other voices for efficiency.